§ 68.318 Additional Limitations.

(Reworded and Changed)

(b) *Registered terminal equipment for automatic dialing.*

(1) Automatic dialing to any individual number is limited to 2 successive attempts. Automatic dialing equipment which employ means for detecting both busy and reorder signals shall be permitted an additional 13 attempts if a busy or reorder signal is encountered on each attempt. The dialer shall be unable to re-attempt a call to the same number for at least 60 minutes following either the second or fifteenth successive attempt, whichever applies, unless the dialer is reactivated by either manual or external means. This rule does not apply to manually activated dialers which dial a number once following each activation.

NOTE: Emergency alarm dialers and dialers under external computer control are exempt from these requirements.

(2) If means are employed for detecting both busy and reorder signals, the automatic dialing equipment shall return to its on-hook state within 15 seconds after detection of a busy or reorder signal.

(3) If the called party does not answer, the automatic dialer shall return to the on-hook state within 60 s of completion of dialing.

(4) If the called party answers, and the calling equipment does not detect a compatible terminal equipment at the called end, then the automatic dialing equipment shall be limited to one additional call which is answered. The automatic dialing equipment shall comply with (1), (2), and (3) for additional call attempts that are not answered.

(5) Sequential dialers shall dial only once to any individual number before proceeding to dial another number.

(6) Network addressing signals shall be transmitted no earlier than:

(i) 70 ms after receipt of dial tone at the network demarcation point;

OR

(ii) 600 ms after automatically going off-hook (for single line equipment that does not use dial tone detectors);

OR

(iii) 70 ms after receipt of CO ground start at the network demarcation point.

Rationale for Harmonized Requirement

The proposal for the two attempt limit on all automatic dialers that do not have the capability to detect busy tones is intended to limit automatic dialed calls to wrong numbers, e.g., Fax calls to non-Fax lines. The 15 call attempt rule is retained for those automatic dialers that can distinguish busy tones and is consistent with the present requirements in both regulations. Adoption of the requirements will assure that the network facilities are not tied up unnecessarily thus potentially denying other customers access to the facilities to make or receive calls. The 70 ms requirement in (6)(i) and (iii) is consistent with the ANSI standard ANSI T1.401-1988 which states that the network is not ready to accept network addressing earlier than 70 ms after dial tone is received. This requirement will prevent early network addressing which will produce incorrect addressing and potentially wrong numbers. This ties up the network and prevents other customers from making calls.

Miscellaneous Rule Changes

(New and Changed)

§ 68.2(a)(3)

Delete

(3) Of all PBX (or similar) systems to private line services for tie trunk type interfaces and off premises station lines. ~~automatic identified outward dialing, and message registration.~~ Services may only be added to this section as a result of rulemaking proceedings and equipment connected to such added services is afforded a reasonable transition period.

Rationale

The deletion of automatic identified outward dialing and message registration from the technical rules in Subpart D of the rules would require the deletion of these services from the Scope of the rules.

§ 68.2(d)

Add

(d) Grandfathered private branch exchange (or similar) systems for connection to private line type services (tie trunk type services, off-premises station lines automatic identified outward dialing and message registration):

(4) PBX (or similar) systems connected with automatic identified outward dialing or message registration private line services of a type which complies with § 68.2(d)(l) and § 68.2(d)(2) may remain connected for life without registration unless subsequently modified.

Rationale

With the deletion of AIOD and MR from the rules, existing connections of grandfathered systems must be continued to be allowed under the new rules. Since there have been no registrations of these systems there is no need to address registered systems.

§ 68.2(j)

New

(j) Terminal equipment and systems registered prior to the (Date of adoption of the rules) do not have to be re-registered unless subsequently modified. All new equipment and systems manufactured after (Register only date) must conform to the requirements.

Rationale

Terminal and equipment that has been registered under the existing rules should not be required to meet the new requirements. However, new models, modified products and new products introduced after the adoption of these rule proposals (the register only date) must meet the new requirements.

§68.222 AIOD Trunk and Station Number Verification.

Delete entire Section.

Rationale

With the adoption of the proposed deletion of AIOD requirements this section is no longer required.

§ 68.3 Definitions:

Capture Level: Equipment with AGC (Automatic Gain Control) signal power limiting has virtually no output signal for input levels below a certain value. At some input signal power, the output level will become significant (usually corresponding to the expected output level for service application. The input level at which this occurs is defined as the "capture level."

Overload Point: (1) For signal power limiting circuits incorporating automatic gain control method, the "overload point" is the value of the input signal that is 15 dB greater than the capture level. (2) For signal power limiting circuits incorporating peak limiting method, the "overload point" is defined as the input level at which the equipment's through gain decreases by 0.4 dB from its nominal constant gain.

DTMF: DTMF network control signalling is a method of signalling using the voice transmission path. The method employs sixteen (16) distinct

signals each composed of two (2) voiceband frequencies, one from each of two (2) geometrically spaced groups designated "low group" and "high group." The selected spacing assures that no two frequencies of any group combination are harmonically related.

Voiceband: The voiceband for analog interfaces is the frequency band from 200 Hz to 3995 Hz.

Zero Level Decoder: The zero level decoder shall comply with the u=255 PCM encoding law as specified in ITU-TSS (CCITT) Rec. G.711 for voiceband encoding and decoding.

(Delete)

AIOD data channel simulator

AIOD leads

Message register leads

Message register signaling channel simulator

Tie trunk transmission interfaces
(c) 4-wire conventional terminating set (CTS)

Figure 68.3(g) AIOD Data Channel Simulator Circuit

Figure 68.3(h) Message Register Signaling Channel Simulator

Rationale

Adoption of the proposed rule changes requires that new definitions be added to the rules. In addition those definitions and figures relating to AIOD and message registration are deleted from the rules.

Figure 68.308(c) Resistive Terminations Ground Return (MR Simulator Mode 2)

Delete

Rationale

With the adoption of the proposed deletion of MR from the rules this figure is no longer required.

SUBPART D - Conditions for Registration

§ 68.300 Labeling requirements.

(a) Registered terminal equipment and registered protective circuitry shall have prominently displayed on an outside surface the following information in the following format:

Complies With Part 68, FCC Rules
FCC Registration Number: _____
Ringer Equivalence: _____

(b) Registered terminal equipment and registered protective circuitry shall also have the following identifying information permanently affixed thereto:

(1) Grantee's name.

(2) Model number, as specified in the registration application.

(3) Serial number or date of manufacture.

(4) Country of origin of the equipment: Made in ____. Required if the equipment is not manufactured in the United States. (Country of origin shall be determined in accordance with 19 U.S.C. 1304 and regulations promulgated thereunder.)

(5) As used herein, "permanently affixed" means that the required nameplate data is etched, engraved, stamped, indelibly printed or otherwise permanently marked. Alternatively, the required information may be permanently marked on a nameplate of metal, plastic, or other material fastened to the enclosure by welding, riveting, etc., or with a permanent adhesive. Such a nameplate must be able to last the expected lifetime of the equipment in the environment in which the equipment will be operated and must not be readily detachable.

(c) When the device is so small or for such use that it is not practical to place the statements specified in this section on it, the information required by § 68.300(a) and (b) shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user. The FCC Registration Number and the Model Number shall be displayed on

the device.

§ 68.302 Environmental simulation.

Unpackaged Registered Terminal Equipment and Registered Protective Circuitry shall comply with all the rules specified in this subpart, both prior to and after the application of the mechanical and electrical stresses specified in this section, notwithstanding that certain of these stresses may result in partial or total destruction of the equipment. Both telephone line surges, Type A and Type B, shall be applied as specified in § 68.302(b) and § 68.302(c). Different failure criteria apply for each surge type.

(a) *Mechanical Shock.*

(1) *Hand-Held Items Normally Used at Head Height:* 18 random drops from a height of 1.5 meters onto concrete covered with 3 millimeters asphalt tile or similar surface.

(2) *Table (Desk) Top Equipment 0-5 kilograms:* Six random drops from a height of 750 millimeters onto concrete covered with 3 millimeters asphalt tile or similar surface.

(3) *The drop tests specified in the mechanical shock conditioning stresses shall be performed as follows:* The unit should be positioned prior to release to ensure as nearly as possible that for every six drops there is one impact on each of the major surfaces and that the surface to be struck is approximately parallel to the impact surface.

(b) *Telephone Line Surge - Type A.*

(1) *Metallic.* Apply two metallic voltage surges (one of each polarity) between any pair of connections on which lightning surges may occur; this includes (i) tip to ring, (ii) tip 1 to ring 1 and (iii) for a 4-wire connection which uses simplexed pairs for signalling, tip to ring 1 and ring to tip 1.

The surge shall have an open circuit voltage waveform in accordance with Figure 68.302(a) having a front time (t_f) of 10 μs maximum and a decay time (t_d) of 560 μs minimum, and shall have a short circuit current waveshape in accordance with Figure 68.302(b) having a front time (t_f) of 10 μs maximum and a decay time (t_d) of 560 μs minimum. The peak voltage shall be at least 800 volts and the peak short circuit current shall be at least 100 amperes. Surges are applied:

(A) With the equipment in all states that can affect compliance with the

requirements of Part 68. If an equipment state cannot be achieved by normal means of power, it may be achieved artificially by appropriate means;

(B) With equipment leads not being surged (including telephone connections, auxiliary leads, and terminals for connection to non-registered equipment) terminated in a manner which occurs in normal use;

(C) Under reasonably foreseeable disconnection of primary power sources, with primary power cords plugged and unplugged, if so configured.

(2) *Longitudinal.* Apply two longitudinal voltage surges (one of each polarity) from any pair of connections on which lightning surges may occur, this includes the tip-ring pair and the tip 1 - ring 1 pair, to earth grounding connections; and to all leads intended for connection to non-registered equipment, connected together.

The surge shall have an open circuit voltage waveform in accordance with Figure 68.302(a) having a front time (t_f) of 10 μs maximum and a decay time (t_d) of 160 μs minimum, and shall have a short circuit current waveshape in accordance with Figure 68.302(b) having a front time (t_f) of 10 μs maximum and a decay time (t_d) of 160 μs minimum. The peak voltage shall be at least 1500 volts and the peak short circuit current shall be at least 200 amperes. Surges are applied:

(i) With the equipment in all states that can affect compliance with the requirements of Part 68. If an equipment state cannot be achieved by normal means of power, it may be achieved artificially by appropriate means;

(ii) With equipment leads not being surged (including telephone connections, auxiliary leads, and terminals for connection to non-registered equipment) terminated in a manner which occurs in normal use;

(iii) Under reasonably foreseeable disconnection of primary power sources, with primary power cords plugged and unplugged, if so configured.

(3) *Failure Modes resulting from application of Type A telephone line surges .* Regardless of operating state, equipment and circuitry are allowed to be in violation of the longitudinal balance requirements of § 68.310(b) and (c) and, for terminal equipment connected to Local Area Data Channels, the longitudinal signal power requirements of § 68.308(f)(3), provided that:

(i) Such failure results from an intentional, designed failure mode which has the effect of connecting telephone or auxiliary connections with earth ground; and,

(ii) If such a failure mode state is reached, the equipment is designed in such a

manner that it would become substantially and noticeably unusable by the user, or an indication is given (e.g., an alarm), in order that such equipment can be immediately disconnected or repaired.

NOTE: The objective of this Subsection is to allow for safety circuitry to either open-circuit, which would cause a permanent on-hook condition, or to short-circuit to ground, as a result of an energetic lightning surge. Off-hook tests would be unwarranted if the off-hook state cannot be achieved. A short to ground has the potential for causing interference resulting from longitudinal imbalance, and therefore designs must be adopted which will cause the equipment either to be disconnected or repaired rapidly after such a state is reached, should it occur in service.

(c) *Telephone Line Surge - Type B.*

(1) *Metallic.* Apply two metallic voltage surges (one of each polarity) to equipment between any pair of connections on which lightning surges may occur; this includes (i) tip to ring, (ii) tip 1 to ring 1 and (iii) for a 4-wire connection which uses simplexed pairs for signalling, tip to ring 1 and ring to tip 1.

The surge shall have an open circuit voltage waveform in accordance with Figure 68.302(a) having a front time (t_f) of 9 μs (± 30%) and a decay time (t_d) of 720 μs (± 20%) and shall have a short circuit current waveshape in accordance with Figure 68.302(b) having a front time (t_f) of 5 μs (± 30%) and a decay time (t_d) of 320μs (± 20%). The peak voltage shall be at least 1000 volts and the peak short circuit current shall be at least 25 amperes. The wave shapes are based on the use of ideal components in Figure 68.302(c) with S_2 in Position M. Surges are applied:

(A) With the equipment in all states that can affect compliance with the requirements of Part 68. If an equipment state cannot be achieved by normal means of power, it may be achieved artificially by appropriate means.

(B) With equipment leads not being surged (including telephone connections, auxiliary leads, and terminals for connection to non-registered equipment) terminated in a manner which occurs in normal use.

(C) Under reasonably foreseeable disconnection of primary power sources, with primary power cords plugged and unplugged, if so configured.

(2) *Longitudinal.* Apply two longitudinal voltage surges (one of each polarity) from any pair of connections on which lightning surges may occur, this includes the tip-ring pair and the tip 1 - ring 1 pair to earth grounding connections and to all leads intended for connection to non-registered equipment, connected together.

For each output lead of the surge generator, with the other lead open, the surge shall have an open circuit voltage waveform in accordance with Figure 68.302(a) having a front time (t_f) of 9 μs (± 30%) and a decay time (t_d) of 720 μs (± 20%) and shall have a short circuit current waveshape in accordance with Figure 68.302(b) having a front time

(t_r) of 5 μs (± 30%) and a decay time (t_d) of 320μs (± 20%). The peak voltage shall be at least 1500 volts and the peak short circuit current shall be at least 37.5 amperes. The wave shapes are based on the use of ideal components in Figure 68.302(c) with S_2 in Position L. Surges are applied:

(i) With the equipment in all states that can affect compliance with the requirements of Part 68. If an equipment state cannot be achieved by normal means of power, it may be achieved artificially by appropriate means.

(ii) With equipment leads not being surged (including telephone connections, auxiliary leads, and terminals for connection to non-registered equipment) terminated in a manner which occurs in normal use.

(iii) Under reasonably foreseeable disconnection of primary power sources, with primary power cords plugged and unplugged, if so configured.

(3) *Failure Modes resulting from application of Type B telephone line surges .* Registered terminal equipment and registered protective circuitry shall be capable of withstanding the energy of Surge Type B without causing permanent opening or shorting of the interface circuit and without sustaining damage that will affect compliance with these rules.

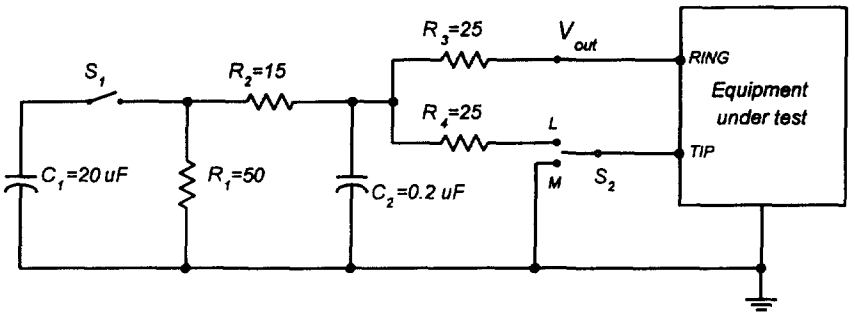

Fig. 68.302 (Xa) - Simplified Surge Gene rator

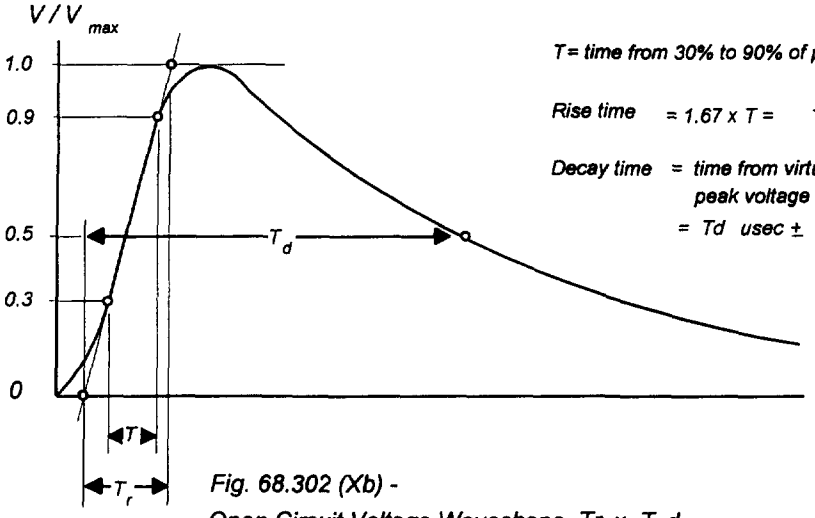

Fig. 68.302 (Xb) -
Open Circuit Voltage Waveshape, Tr x T d

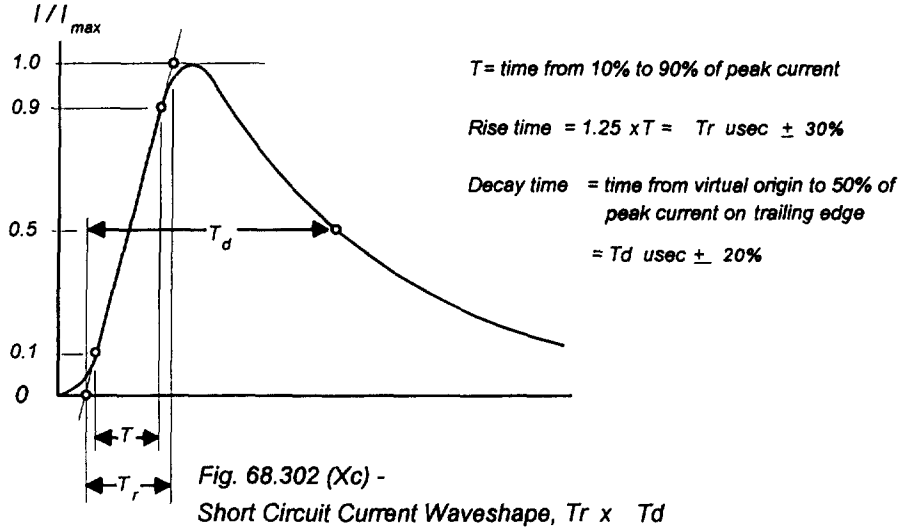

Fig. 68.302 (Xc) -
Short Circuit Current Waveshape, Tr x Td

(d) *Power Line Surge.*

(1) Apply six power line surges (three of each polarity) between the phase and neutral terminals of the ac power line while the equipment is being powered. The surge shall have an open circuit voltage waveform in accordance with Figure 68.302(a) having a front time (t_f) of 2 μs maximum and a decay time (t_d) of 10 μs minimum and shall have a short circuit current waveshape in accordance with Figure 68.302(b) having a front time (t_f) of 2 μs maximum and a decay time (t_d) of 10 μs minimum. The peak voltage shall be at least 2500 volts and the peak short circuit current shall be at least 1000 amperes. Surges are applied:

(i) With the equipment in states that can effect compliance with the requirements of Part 68. If an equipment state cannot be achieved by normal means of power, it may be achieved artificially by appropriate means.

(ii) With equipment leads not being surged (including telephone connections, auxiliary leads, and terminals for connection to non-registered/non-certified equipment) terminated in a manner which occurs in normal use.

(2) *Failure Modes resulting from application of power line surge.* Registered terminal equipment and registered protective circuitry shall comply with all the criteria contained in the rules and regulations in this subpart, both prior to and after the application of the power line surge specified in section d, not withstanding that this surge may result in partial or total destruction of the equipment under test.

§ 68.304 Leakage current limitations.

Registered terminal equipment and registered protective circuitry shall have a voltage applied to the combination of points listed in the table below. The test voltage shall be ac of 50 or 60 Hz rms.

(a) All telephone connections,

(b) All power connections,

(c) All possible combinations of exposed conductive surfaces on the exterior of such equipment or circuitry including grounding connection points, but excluding terminals for connection to other terminal equipment,

(d) All terminals for connection to registered protective circuitry or non-registered equipment,

(e) All auxiliary lead terminals,

(f) All E&M lead terminals, and

(g) All PR, PC, CY1 and CY2 leads.

Gradually increase the voltage from zero to the values listed in the table below over a 30-second time period, then maintain the voltage for one minute. The current in the mesh formed by the voltage source and these points shall not exceed 10 mA peak at any time during this 90-second interval.

Equipment states necessary for compliance with the requirements of this section which cannot be achieved by normal means of power shall be achieved artificially by appropriate means.

Table 68.304(a)

Voltage Applied for Various Combinations
Of Electrical Connections

Voltage source connected between:	ac Value*
(a) and (b) (see NOTES 1, 2, 3)	1500
(a) and (c) (see NOTES 1, 2)	1000
(a) and (d) (see NOTES 1, 2)	1000
(a) and (e) (see NOTES 1, 2)	1000
(a) and (f) (see NOTES 1, 2)	1000
(a) and (g) (see NOTES 1,2)	1000
(b) and (c) (see NOTE 3)	1500
(b) and (d) (see NOTE 3)	1500
(b) and (e) (see NOTE 3)	1500
(b) and (f) (see NOTE 3)	1500
(b) and (g) (see NOTE 3)	1500
(c) and (e) (see NOTES 1, 2)	1000
(c) and (f) (see NOTES 1, 2)	1000
(d) and (e) (see NOTE 2)	1000
(d) and (f) (see NOTE 2)	1000
(e) and (f) (see NOTE 2)	1000

*Value to which test voltage is gradually increased.

NOTES:

(1) A telephone connection, auxiliary lead, or E&M lead that has an intentional dc conducting path to earth ground at operational voltages (such as a ground start lead), may be excluded from the leakage current test in that operational state. Leads or connections excluded for this reason shall comply with the requirements of § 68.306(e)(i).

A telephone connection, auxiliary lead, or E&M lead that has an intentional dc conducting path to earth ground for protection purposes at the leakage current test voltage (such as through a surge suppressor), may have the component providing the conducting path removed from the equipment for the leakage current test in that operational state. Components removed for this reason shall comply with the requirements of § 68.306(e)(ii).

Filter paths, such as capacitors used in EMI filters, are left in place during leakage current testing, since these components can be a path for excessive leakage.

(2) For multi-unit equipment interconnected by cables, that is evaluated and registered as an interconnected combination or assembly, the specified 10 mA peak maximum leakage current limitation other than between power connection points and other points, may be increased as described here to accommodate cable capacitance. The leakage current limitation may be increased to (10N+0.13L) mA peak where L is the length of interconnecting cable in the leakage path in meters and N is the number of equipment units which the combination or assembly will place in parallel across a telephone connection.

(3) RF filters and surge protectors on the line side of power supplies may be disconnected before making § 68.304 leakage measurements. As an alternative to disconnecting these filters and surge protectors, this measurement may be made using a dc voltage equal to the peak ac test voltage.

§ 68.306 Hazardous voltage limitations.

(a) *General.* Under no condition of failure of registered terminal equipment or registered protective circuitry which can be conceived to occur in the handling, operation or repair of such equipment or circuitry, shall the open circuit voltage on telephone connections exceed 70 volts peak after one second, except for voltages for network control signalling, alerting and supervision.

(1) *Type I E&M Leads.* Registered terminal equipment shall comply with the following requirements for terminal equipment on the "A" or "B" side of the interface as shown in Figures 68.3(e)(i) & (ii):

(i) The dc current on the E lead shall not exceed 100 mA.

(ii) The maximum dc potentials to ground shall not exceed the following when measured across a resistor of 20 kOhms ± 10 %:

Table 68.306(a)

Type I E&M
DC Potentials

	E Lead	M Lead
TE on "B" side originates signals to network on E lead	± 5 V	±5 V
TE on "A" side originates signals to network on M lead	-56.5V; no positive potential with respect to ground	-56.5V; no positive potential with respect to ground

(iii) The maximum ac potential between E&M leads and ground reference shall not exceed 5V peak.

(iv) M lead protection shall be provided to assure that voltages to ground do not exceed 60 volts. For relay contact implementation, a power dissipation capability of 0.5 watt shall be provided in the shunt path.

(v) If the registered terminal equipment contains an inductive component in the E lead, it must assure that the transient voltage across the contact as a result of a relay contact opening does not exceed the following voltage and duration limitations:

(A) 300 volts peak,

(B) A rate of change of one volt per microsecond, and

(C) A 60 volt level after 20 milliseconds.

(2) Type II E&M Leads. Registered terminal equipment shall comply with the following requirements:

(i) For terminal equipment on the "A" side of the interface, the dc current in the E lead shall not exceed 100 mA. The maximum ac potential between the E lead and ground shall not exceed 5 V peak.

(ii) For terminal equipment on the "B" side of the interface, the dc current in the SB lead shall not exceed 100 mA. The maximum ac potential between the SB lead and ground shall not exceed 5 V peak.

(iii) The maximum dc potentials to ground shall not exceed the following when measured across a resistor of 20 kOhms ± 10 %:

Table 68.306(b)

Type II E&M
DC Potentials

	E lead	M lead	SB lead	SG lead
TE on "B" side of the interface originates signals to network on E lead	±5 V	±5 V	-56.5V; no positive potential with respect to ground	±5 V
TE on "A" side of the interface originates signals to network on M lead	-56.5V; no positive potential with respect to ground	±5 V	±5 V	±5 V

(iv) The maximum ac potential to ground shall not exceed 5V peak on the following leads, from sources in the terminal equipment:

- M, SG and SB leads for terminal equipment on the "A" side of the interface.
- E, SG and M leads for terminal equipment on the "B" side of the interface.

(v) If the registered terminal equipment contains an inductive component in the (E) or (M) lead, it must assure that the transient voltage across the contact as a result of a relay contact opening, does not exceed the following voltage and duration limitations:

(A) 300 volts peak,

(B) A rate of change of one volt per microsecond, and

(C) A 60 volt level after 20 milliseconds.

(3) *Off premises station voltages.*

(i) Talking battery or voltages applied by the PBX (or similar systems) to all classes of OPS interface leads for supervisory purposes must be negative with respect to ground, shall not be more than -56.5 volts dc with respect to ground, and shall not have a significant ac component.*

**The ac component should not exceed 5 volts peak or the dc component shall not exceed 5 volts, where not otherwise controlled by § 68.308.*

(ii) Ringing signals applied by the PBX (or similar systems) to all classes of OPS interface leads shall comply with requirements in paragraph (d) of this section. Ringing voltages shall be applied between the ring conductor and ground.

(4) *Direct Inward Dialing (DID).*

Voltages applied by the PBX (or similar systems) to DID interface leads for supervisory purposes must be negative with respect to ground, shall not be more than -56.5 volts dc with respect to ground, and shall not have a significant ac component.*

**The ac component shall not exceed 5 volts peak or the dc component shall not exceed 5 volts, where not otherwise controlled by § 68.308.*

(5) *Local Area Data Channel Interfaces.* For Local Area Data Channel interfaces, during normal operating modes including terminal equipment initiated maintenance signals, registered terminal equipment shall assure, except during the application of ringing (limitations specified in paragraph (d) of this section), with respect to telephone connections (tip, ring, tip 1, ring 1) that:

(i) Under normal operating conditions, the rms current per conductor between short-circuit conductors, including dc and ac components, does not exceed 350 milliamperes. For other than normal operating conditions, the rms current between any conductor and ground or between short-circuited conductors, including dc and ac components, may exceed 350 milliamperes for no more than 1.5 minutes;

(ii) The dc voltage between any conductor and ground does not exceed 60 volts. Under normal operating conditions it shall not be positive with respect to ground

(though positive voltages up to 60 volts may be allowed during brief maintenance states);

(iii) Ac voltages are less than 42.4 volts peak between any conductor and ground, (terminal equipment shall comply while other interface leads are both (A) unterminated and (B) individually terminated to ground); and,

(iv) Combined ac and dc voltages between any conductor and ground are less than 42.4 volt peak when the absolute value of the dc component is less than 21.2 volts, and less than (32.8 + 0.454 x Vdc) when the absolute value of the dc component is between 21.2 and 60 volts.

(6) *Ringdown Voiceband Private Line and Voiceband Metallic Channel Interface.* During normal operation, registered terminal equipment for connection to ringdown voiceband private line interfaces or voiceband metallic channel interfaces shall assure that:

(i) Ringing voltage does not exceed the voltage and current limits specified in paragraph (d), and is: (A) applied to the ring conductor with the tip conductor grounded for 2-wire interfaces, or (B) simplexed on the tip and ring conductors with ground simplexed on the tip (1) and ring (1) conductors for 4-wire interfaces.

(ii) Except during the signaling mode or for monitoring voltage, there is no significant positive dc voltage with respect to ground (not over +5 volts): (A) for 2-wire ports between the tip lead and ground and the ring lead and ground and (B) for 4-wire ports between the tip lead and ground, the ring lead and ground, the tip 1 lead and ground, and the ring 1 lead and ground.

(iii) The dc current per lead, under short circuit conditions shall not exceed 140 milliamperes.

(b) *Connection of non-registered equipment to registered terminal equipment or registered protective circuitry.*

(1) *General.* Leads to, or any elements having a conducting path to telephone connections, auxiliary leads or E&M leads shall:

(i) Be reasonably physically separated and restrained from and be neither routed in the same cable as nor use the same connector as leads or metallic paths connecting power connections;

(ii) Be reasonably physically separated and restrained from and be neither routed in the same cable as nor use adjacent pins on the same connector as metallic

paths to lead to nonregistered equipment, when specification details provided to the Commission, pursuant to, § 68.200(g), do not show that interface voltages are less than non-hazardous voltage source limits in § 68.306(c).

(c) *Non-Hazardous Voltage Source.* A voltage source is considered a non-hazardous voltage source if it conforms with the requirements of § 68.302, § 68.304 and § 68.306(b) of this document, with all connections to the source other than primary power connections treated as "telephone connections," and if such source supplies voltages no greater than the following under all modes of operation and of failure:

(1) Ac voltages less than 42.4 volts peak;

(2) Dc voltages less than 60 volts; and

(3) Combined ac and dc voltages less than 42.4 volts peak when the absolute value of the dc component is less than 21.2 volts and less than (32.8 + 0.454 x V dc) when the absolute value of the dc component is between 21.2 and 60 volts.

(d) *Ringing Sources.* Except for class A OPS interfaces, ringing sources shall meet all of the following restrictions:

(1) *Ringing Signal Frequency.* The ringing signal shall use only frequencies whose fundamental component is equal to or below 70 Hz.

(2) *Ringing Signal Voltage.* The ringing voltage shall be less than 300 V peak-to-peak and less than 200 V peak-to-ground across a resistive termination of at least 1 megOhm.

(3) *Ringing Signal Interruption Rate.* The ringing voltage shall be interrupted to create quiet intervals of at least one second (continuous) duration each separated by no more than 5 seconds. During the quiet intervals, the voltage to ground shall not exceed the voltage limits given in § 68.306(a)(3)(1).

(4) *Ringing Signal Sources.* Ringing voltage sources shall comply with the following requirements:

(i) If the ringing current through a 500 Ohm(s) (and greater) resistor does not exceed 100 mA peak-to-peak, neither a ring trip device nor a monitoring voltage are required.

(ii) If the ringing current through a 1500 Ohm (and greater) resistor exceeds 100 mA peak-to-peak, the ringing source shall include a current-sensitive ring trip device in series with the ring lead that will trip ringing as specified in Figure 68.306(a) in

accordance with the following conditions:

(A) If the ring trip device operates as specified in Figure 68.306(a) with R = 500 Ohm (and greater) no monitoring voltage is required;

(B) If, however, the ring trip device only operates as specified in Figure 68.306(a) with R = 1500 Ohm (and greater) then the ringing voltage source shall also provide a monitoring voltage between 19 V dc and 56.5 V dc, negative with respect to ground, on the tip or ring conductor.

(iii) If the ringing current through a 500 Ohm (and greater) resistor exceeds 100 mA (peak-to-peak) but does not exceed 100 mA peak-to-peak with 1500 Ohm (and greater) termination, the ringing voltage source shall include either a ring trip device that meets the operating characteristics specified in Figure 68.306(a) with 500 Ohm (and greater), or a monitoring voltage as specified in (4)(ii)(B) above.

NOTE: If the operating characteristics specified in Figure 68.306(a) are not met with both the 500 Ohm and 1500 Ohm terminations, then the terminal equipment under test fails (See Table 68.306(c)).

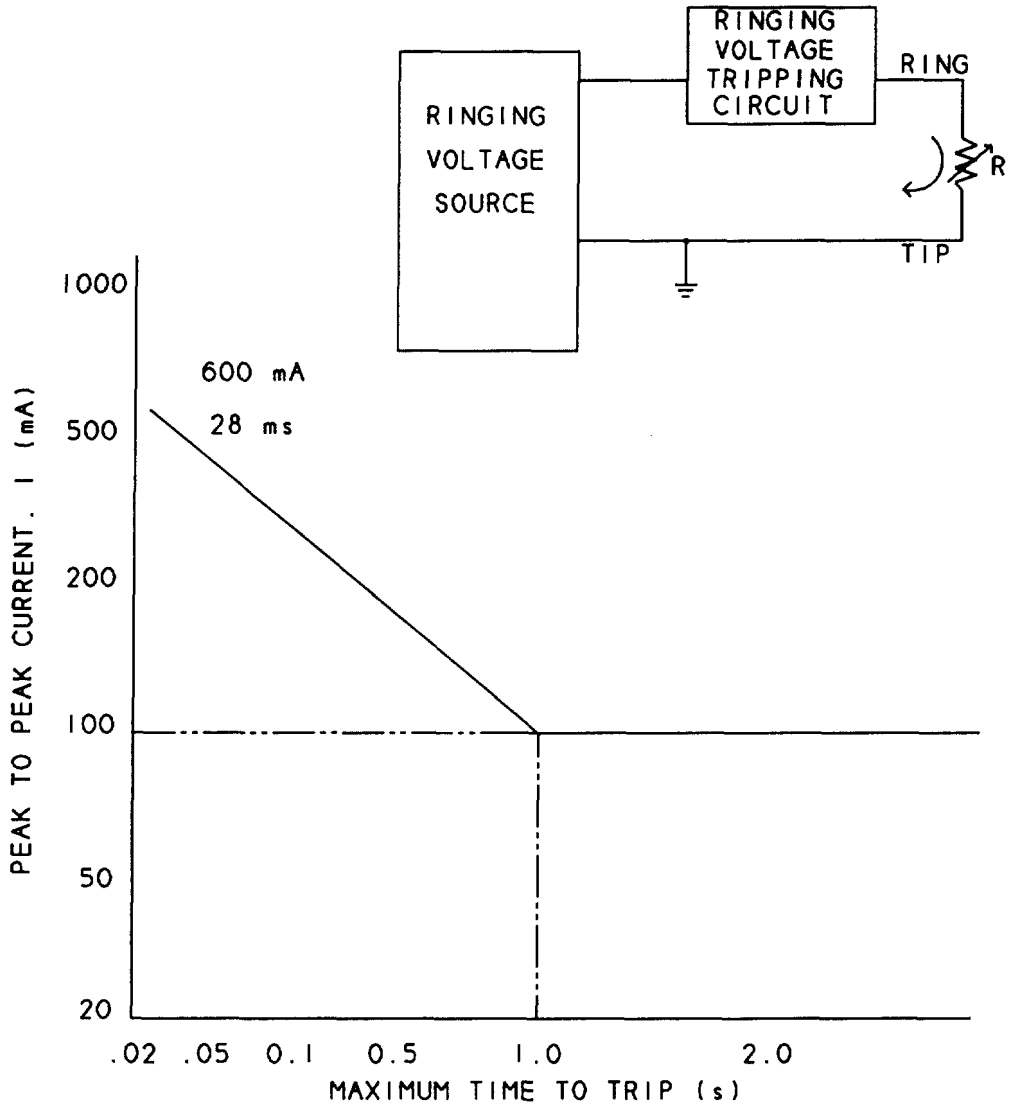

Figure 68.306(a)

Illustration of Ring Trip Requirement

Table 68.306(c)

Summary of Ring Trip Requirements

Section 68.306 (d) (4).	Ringing Current (mA p.p)		Function Required		Ring Trip Device operates per Figure 68.306(a)
	R=500 Ohm & Greater	R=1500 Ohm & Greater	Ring Trip	Monitor Voltage	
(i)	< 100	< 100	Optional	Optional	Optional
(ii) (A)	N/A	> 100	Yes	Optional	Yes for both resistances
(ii) (B)	N/A	> 100	Yes	Yes	Yes for R=1500 Ohm & greater No for R=500 Ohm & greater
(iii)	> 100	< 100	Either Ring-Trip Device or Monitor Voltage required		Yes for R = 500 Ohm & greater, if Ring Trip Device is used

(e) *Intentional paths to ground* (as required by § 68.304).

(1) *Connections with operational paths to ground.* Registered terminal equipment and registered protective circuitry having an intentional dc conducting path to earth ground at operational voltages that was excluded during the leakage current test of § 68.304 shall have a dc current source applied between the following points:

(i) Telephone connections, including tip, ring, tip 1, ring 1, E&M leads and auxiliary leads, and

(ii) Earth grounding connections.

For each test point, gradually increase the current from zero to 1 ampere, then maintain the current for one minute. The voltage between (i) and (ii) shall not exceed 0.1 volt at any time.

NOTE: In the event there is a component or circuit in the path to ground, the requirement shall be met between the grounded side of the component or circuit and the earth grounding connection.

(2) *Connections with protection paths to ground.* Registered terminal equipment and protective circuitry having an intentional dc conducting path to earth ground for protection purposes at the leakage current test voltage that was removed during the leakage current test of § 68.304 shall, upon its replacement, have a 50 or 60 Hz voltage source applied between the following points:

NOTE: The path to ground is reestablished when the leads are replaced.

(i) Simplexed telephone connections, including tip and ring, tip 1 and ring 1, E&M leads and auxiliary leads, and

(ii) Earth grounding connections.

Gradually increase the voltage from zero to 120 volts rms for registered terminal equipment, or 300 volts rms for protective circuitry, then maintain the voltage for one minute. The current between (i) and (ii) shall not exceed 10 mA peak at any time.

As an alternative to carrying out this test on the complete equipment or device, the test may be carried out separately on components, subassemblies, and simulated circuits, outside the unit, provided that the test results would be representative of the results of testing the complete unit.

§ 68.308 Signal power limitations.

(a) *General.* Limits on signal power shall be met at the interface for all 2-wire network ports and, where applicable to offered services, both transmit and receive pairs of all 4-wire network ports. Signal power measurements shall be made using terminations as specified in each of the following limitations. The transmit and receive pairs for 4-wire network ports shall be measured with the pair not under test connected to a termination equivalent to that specified for the pair under test. Through gain limitations apply only in the direction of transmission toward the network.

(b) *Voiceband metallic signal power.*

(1) Limitations at the interface on internal signal sources not intended for network control signaling:

(i) The power of all signal energy, in the 200 - 3995 Hz voiceband, delivered by registered terminal equipment or registered protective circuitry to the appropriate loop simulator – other than non-permissive data equipment or data protective circuitry shall not exceed -9 dBm when averaged over any 3 second interval.

(ii) For 2-wire and 4-wire lossless tie trunk type interfaces, the maximum power of other than live voice signals delivered to a 600-Ohm termination shall not exceed -15 dBm when averaged over any three second interval.

(iii) For OPS lines, the maximum power of other than live voice delivered to an OPS line simulator circuit shall not exceed -9 dB with respect to one milliwatt, when averaged over any 3-second interval.

(iv) For registered test equipment or registered test circuitry the maximum signal power delivered to a loop simulator circuit shall not exceed 0 dBm when averaged over any 3-second interval.

(v) For voiceband private lines using ringdown or inband signaling the maximum power of other than live voice signals delivered to a 600 Ohm termination shall not exceed -13 dBm when averaged over any 3-second interval.

(vi) For voiceband private lines using inband signaling in the band 2600 $\pm$ 150 Hz, the maximum power delivered to a 600 Ohm termination shall not exceed -8 dBm during the signaling mode. The maximum power delivered to a 600 Ohm termination in the on-hook steady state supervisory condition shall not exceed -20 dBm. The maximum power of other than live voice signals delivered to a 600 Ohm termination during the non-signaling mode and for other inband systems shall not exceed -13 dBm when averaged over any 3-second interval.

(2) Limitations on internal signal sources primarily intended for network control signaling, contained in voice and data equipment.

(i) For all operating conditions of registered terminal equipment and registered protective circuitry, the maximum power in the frequency band below 3995 Hz delivered to a loop simulator circuit shall not exceed the following when averaged over any 3-second interval:

(A) 0 dBm when used for network control (DTMF);

(B) 0 dBm when DTMF is used for manual entry end-to-end signaling. When

the device is used for this purpose it shall not generate more than 40 DTMF digits per manual key stroke.

(C) -9 dBm in all other cases.

(ii) For tie trunk applications, the maximum power delivered to a 600 Ohm termination for registered terminal equipment and registered protective circuitry under all operating conditions shall not exceed -4 dBm over any 3 second interval.

(3) Registered one port and multiport terminal equipment and protective circuitry with provision for through transmission from other terminal equipment, excluding data equipment and data protective circuitry which are registered in accordance with § 68.308(b)(4).

(i) Where through-transmission equipment provides a dc electrical signal to equipment connected therewith (e.g., for powering of electro-acoustic transducers), dc conditions shall be provided which fall within the range of conditions provided by a loop simulator circuit unless the combination of the through-transmission equipment and equipment connected therewith is registered as a combination which conforms to § 68.308(b)(1) and (2).

(ii) Through-transmission equipment to which remotely connected data terminal equipment may be connected shall not be equipped with or connected to either a Universal or Programmed Data Jack used in data configurations. (See § 68.308(b)(4) and § 68.502(e)).

(4) Registered data circuit terminal equipment shall be capable of operation in at least one of the states discussed in (i), (ii) or (iii) below. The output power level of the data circuit terminal equipment shall not be alterable, by the customer, to levels which exceed the signal power limits specified herein.

(i) Data circuit terminal equipment intended to operate with a programming resistor for signal level control shall not exceed the programmed levels given in Table 68.308(a).

(ii) Data circuit terminal equipment intended to operate in the fixed loss loop (FLL) state shall not transmit signal power that exceeds -4 dBm, in the 200 - 3995 Hz voiceband, when averaged over any and all 3 second intervals.

(iii) Data circuit terminal equipment shall not transmit signals from 200 to 3995 Hz that exceed -9 dBm, when averaged over any and all 3 second intervals.